



## CONCEPT NOTE FOR NEW PI OPERATIONS (STAND-ALONE) IN CHINA

### KEY IDENTIFICATION DATA:

Title/Number:	<b>EU China Cooperation on Carbon Capture and Storage</b> (short: EU China CCS project)
Country/Region	China/Asia
Total cost:	Total estimated cost: €47m Total amount of the EU contribution: €7m
Total duration and target start date of implementation:	42 months, 1.10.2016
Method of implementation:	Indirect management

### DESCRIPTION OF PROPOSED ACTION

#### 1. Action summary

The proposed project is part of a longstanding cooperation between the EU and China on the issue of carbon capture and storage (CCS).<sup>1</sup> CCS uses established technologies to capture, transport and store carbon dioxide emissions from large point sources, such as power stations.<sup>2</sup> Bringing down the CO<sub>2</sub> emissions from the Chinese coal power-plants, and the wider Chinese coal industry, is vital for keeping intact the world's chances to limit global warming to 1,5 or 2 degrees Celsius, as agreed in the UNFCCC Paris Agreement 2015.

The EU China CCS project will consist of feasibility and FEED<sup>3</sup> study for one CCS site in China. Expert cooperation between the EU and China on the deployment of CCS will also be part of the project. In terms of the longer term China-EU Near Zero Emission Coal cooperation (NZEC, see below), the EU China CCS project constitutes NZEC phase IIB. The contract shall be signed with the Asian Development Bank (ADB), the leading multilateral institution on China/CCS. A step-out option for the EU after the inception phase shall be foreseen, should ADB and China not be able to put together a finance package which covers the total costs of the feasibility and FEED study for one site (around € 20m). However, substantial co-financing is expected from Chinese sources, UK, Norway and ADB.

#### 2. Background / Context/ Rationale for PI funding

The proposed project represents phase IIB of the China-EU Near Zero Emission Coal (NZEC) cooperation.<sup>4</sup> NZEC started in 2005 and consisted so far of phase I (identification) and IIA

<sup>1</sup> Also referred to as carbon capture and utilization (CCU) or carbon capture use and storage (CCUS) by China, because carbon capture can be combined with enhanced oil recovery (EOR) or enhanced hydrocarbon recovery (HER), e.g. to raise the output of oilfields.

<sup>2</sup> <http://www.ccsassociation.org/>

<sup>3</sup> FEED: Front-End Engineering Design study. FEED constitutes the technical part of a CCS feasibility study

<sup>4</sup> [http://ec.europa.eu/clima/dossiers/nzec/index\\_en.htm](http://ec.europa.eu/clima/dossiers/nzec/index_en.htm)

(pre-feasibility). Phase IIB (feasibility) which is proposed here shall be followed by phase III (implementation). The original plan was to jointly implement a CCS project in China under NZEC until 2020. However, due to political, technical and organisational delays in the past, this deadline has become challenging.

In NZEC phase IIA (financed by co-donor Norway), pre-feasibility studies have been conducted for the following three power-plant sites in China: Shengli; Tianjin; and Yuhuan. In the final report of NZEC IIA, dated 13.4.2015, the Chinese side proposed the first two sites for the next stage, feasibility. In a verbal note sent to the European Commission on 29.7.2015, the Chinese Ministry of Science and Technology (MOST) formally proposed the two sites Shengli and Tianjin for NZEC IIB. Subsequently, an external CCS expert from an EU member state was contracted by the European Commission to check the Chinese site proposals *sur place* and to assess their technical feasibility.

In its final report dated 3.1.2016<sup>5</sup>, the external expert recommended both sites Shengli (proposed by oil company Sinopec) and Tianjin (proposed by power utility Huaneng) for financing under NZEC IIB.

The Shengli project foresees the instalment of post-combustion CCS-technology at a coal power plant owned by the Sinopec oil company. Advantages are that this technology could be relatively easily deployed in a huge number of other existing and future Chinese coal power plants, and that the absorbed CO<sub>2</sub> could be injected in an adjacent Sinopec-owned oilfield, using enhanced oil recovery (EOR) technique.

In Tianjin, pre-combustion CCS technology is to be applied at an ultramodern coal power plant owned by Huaneng power utility. The overall environmental performance is higher than in the Shengli case. However, further roll out of the technology would also be more difficult. Additionally, the oilfield to be used for EOR is owned by a third party (company Petrochina).

Cost estimates for FEED studies at Shengli and Tianjin are €22m each. Additional CCS policy, regulatory and planning activities are estimated at €3m for both sites.<sup>6</sup> The external EU expert assumes that cost reductions of around 10% are realistic. Norway has indicated a potential co-financing of around €5m. The UK is providing £35m to support CCS development in Asia through the ADB, a part of which will likely be available for NZEC IIB co-financing. Further financial contributions from Chinese sources and the ADB are expected.

The exact costs of the required studies<sup>7</sup> in Shengli and Tianjin can only be determined on the basis of detailed terms of reference (TOR). The ADB would elaborate these TOR in the inception phase of the EU China CCS project. In parallel, co-financing negotiations will be organised by the ADB with Chinese private (project proponents) and public sources, the European Commission, UK, Norway and potential other donors and stakeholders which might still show interest. This inception phase is expected to take 9-12 months. It can result in financing packages for feasibility/FEED for both sites, one of the sites, or none of the sites. In the latter case, the TOR and the sectoral analysis done so far would be provided to the involved Chinese state institutions, and ADB and European Commission would terminate the project at this early stage.

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<sup>5</sup> Andrew Minchener, Final Report to the European Commission regarding the core aspects of the next steps for the China-EU NZEC programme, Contract PI/2015/365-818

<sup>6</sup> These elements constitute the non-technical parts of the feasibility studies which are not covered by FEED.

<sup>7</sup> As well as the exact delimitation between the feasibility- and FEED-elements of the studies

However, this scenario is unlikely. CCS was confirmed as a priority area of EU-China cooperation in the 2015 EU-China joint statement on climate change.<sup>8</sup> CCS is a priority measure in China's Intended Nationally Determined Contribution (INDC) to COP21 Paris, published on 30.6.2015. Detailed proposals for the rollout of CCS in China have been presented by the Chinese Government and ADB in November 2015. Major indicators point to the seriousness with which the Chinese leadership intends to massively apply CCS-technology in the country.

In terms of relevance for the Partnership Instrument, the project fits well to objective 1 of the PI-Regulation (art. 2a), as it supports a major EU bilateral cooperation partnership by promoting policy dialogue and by developing collective approaches and responses to challenges of global concern. 'Progress made by key partner countries in the fight against climate change', mentioned explicitly in PI-objective 1, is the core aim of the activity. It also corresponds with the EU-China 2020 Strategic Agenda for Cooperation (chapter Climate Change and Environmental Protection). The wish of China to get EU support on CCS has been expressed in several EU-China high level statements since the start of the NZEC cooperation in 2005. It corresponds also to priority 2 of the Europe 2020 Strategy, to promote a more resource efficient, greener and more competitive economy, by fostering EU-China industrial cooperation on a key global climate change challenge of our time.

### **3. Programme description**

On the basis of the above described extensive preparation of this project in 2014-2015, the following objectives, results and activities of the project are proposed. They can be adjusted in the subsequent Action Fiche, based on comments by other services, further discussions with other donors, and further preparatory work by the ADB.

#### Overall objective:

The suggested overall objective of the project is substantial progress made by key partner country China in the fight against climate change (in accordance with PI Regulation, art 2a).

#### Specific objectives:

The proposed specific objectives of the project are to:

- (i) Create shared knowledge by implementing a joint feasibility and FEED study at a site which was identified in previous phases of the relevant EU-China cooperation.
- (ii) Strengthen EU-China cooperation on CCS by implementing phase IIB of the China-EU Near Zero Emission Coal initiative, thereby fulfilling the EU's repeated political commitment to cooperate with China on the issue and offering business opportunities to specialised EU companies, where feasible.
- (iii) Contribute to an environmentally sound breakthrough of the carbon capture and storage in China, to lower CO<sub>2</sub> emissions from the China's coal sector.

#### Expected results:

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<sup>8</sup> The statement was adopted in the framework of the EU China Leaders' Summit of 29.6.2015 and was published on <http://www.consilium.europa.eu/en/press/press-releases/2015/06/29-eu-china-climate-statement/>

Given the specific objectives above, the expected results of the EU-China CCS project are:

(i) A CCS feasibility and FEED-study for either the Sinopec Shengli or the Huaneng Tianjin has been finalised. In case of strong Chinese and donors co-funding, studies for both sites have been conducted.

(ii) The China EU NZEC cooperation has been continued and long-standing political commitments by the EU have been kept, thereby deepening expert contacts and opening up business opportunities for specialized EU consultancies, institutes, and environment technology and engineering companies.

(iii) Phase III of NZEC has successfully been prepared, leading to subsequent implementation of a major CCS demonstration project in China. Accompanying work of the EU-China CCS project will foster the elaboration and implementation of sectorial standards, strategies and policies, along the lines of the November 2015 China CCS roadmap.

Main activities: The foreseen main activities of the 42 months EU China CCS project are:

Inception Phase (9-12 months): An extended inception phase is needed for ADB to:

- elaborate detailed TOR for feasibility/FEED studies for sites Shengli and Tianjin
- revise cost estimates for these studies
- organise a NZEC steering committee meeting in China
- organise co-financing discussions between Chinese and donor stakeholders
- plan expert dialogues between EU and Chinese CCS stakeholders
- draft an Inception Report addressed to European Commission, MOST and NDRC

By accepting the inception report by the ADB, the European Commission will give its agreement to the continuation of the project and the use of the full project budget.

Implementation Phase (30-33 months), divided into:

- 6 months for tender for 1-2 feasibility/FEED studies at Shengli and/or Tianjin
- 24-27 months for carrying out 1-2 feasibility/FEED studies at Shengli and/or Tianjin
- Sectorial regulatory support and EU China CCS dialogue throughout implementation

#### **4. Impact/sustainability**

Financing of a feasibility study under IIB of the China-EU Near Zero Emission Coal cooperation is a long-standing political commitment from the EU side, and vital for keeping the EU's credibility towards key Chinese partners on climate change. The potential impact of the project for the Chinese coal sector is huge, but sustainability can only be assured by national Chinese climate and energy policies, and commitments on a national and international level. China's National Plan on Climate Change for 2014-2020, its ambitious Intended Nationally Determined Contribution (INDC) to the COP21 Paris climate conference of December 2015, the 13<sup>th</sup> Five-Year Plan (2016-2020) and China's CCS Roadmap are all indications that this national and international commitment exists.

#### **5. Implementation arrangements**

The proposed implementation arrangement is indirect management with the Asian Development Bank.

The ADB is the international development bank most involved in the issue of CCS in China. The bank has been supporting China on the issue since 2009 through a set of technical assistance projects, to analyse issues, identify the strategic fit of CCS in the existing portfolio of low carbon technologies in China, to strengthen capacity to overcome key barriers and develop readiness to bring forward CCS demonstration and deployment. Internationally, ADB has created a CCS Fund with current contributions from the UK and the Global Carbon Capture and Storage Institute to help prepare its country members for CCS demonstration. China is the most active recipient country from this fund.

In the Action Fiche, the option of a contribution of the European Commission to the CCS Fund of the ADB will be discussed. It is however assumed that a bilateral contract between the Commission and the ADB will be the more straightforward solution, accompanied by subsequent cooperation agreements or Memoranda of Understanding with the UK and Norway which are expected to provide parallel finance.

On the Chinese side, the foreseen project partners are the Ministry of Science and Technology, especially its Administrative Centre for China's Agenda 21, which are longstanding partners in the EU China NZEC cooperation. The National Development and Reform Commission (NDRC) as coordinator for climate policy issues in China will also be involved. The NDRC has recently founded a working group on CCS deployment with relevant Chinese stakeholders. The Chinese National Energy Administration will also be associated. The proponents of the two CCS sites, Sinopec and Huaneng will be either co-opted as observers in the NZEC Steering Committee or will be part of a Steering Committee to be formed for the implementation of this EU China CCS project.

The foreseen international financing partners are the UK and Norway, which are both active long-term donors on China CCS. Formal cooperation with them will be assured through the NZEC Steering Committee and/or the Steering Committee of the EU China CCS project (possibly in observer functions, depending on their financial engagement).

## **6. Risk assessment and management**

Carbon capture and storage is a proven but complex approach which poses challenges and risks in terms of technology, project management and finance. Implementation of the China-EU NZEC programme has been slower than expected in the last years, but is still considered a success by all involved parties. In order to keep the momentum, a quick financing decision by the Partnership Instrument, even if preliminary, would be vital to keep the process on track, and to allow the organisation of the next NZEC Joint Steering Committee in which the further cooperation between China, the EU, UK and Norway in NZEC phases IIB (feasibility/FEED study) and later phase III (construction of a demonstration project) shall be established.

The main strategies as far as project management risk on the EU-side is concerned a strong guidance of the process by the China desk in DG CLIMA A2, with involvement of the responsible technical unit for CCS (DG CLIMA C4). The China desk of DG ENER and the responsible technical unit C2 for CCS in DG ENER shall also be closely associated in the implementation of the EU China CCS project, as well as the EU Delegation in Beijing.

In terms of broader energy and climate policy in China and worldwide, there is the major policy consideration that any investment in carbon power plant technologies might make this sector of power generation more ecologically acceptable and thereby prolong its lifespan. However, coal is currently dominant to an extent in the Chinese coal sector to which a quick phase-out seems utterly unrealistic. All available low- and non-polluting technologies will

likely have to be developed and deployed in parallel, if any realistic possibility to limit global warming to 1,5 or 2 degrees Celsius shall remain intact. The promotion of CCS is official EU policy both internally as well as externally in dialogue with partners like China.

In terms of Intellectual Property Rights (IPR), there is likely no major risk for the European side in the proposed project. In a way, the IPR risk lies even more on the Chinese side for this phase, as it will have to provide detailed site-related information to the contractors selected by the ADB. IPR issues for the EU-side could indeed arise in NZEC phase III, implementation. It will be the task of the consultants to be selected and to look in detail into these issues.

The final risk of the project is that phase III of the project, implementation of a CCS demonstration project in China, does not find sufficient financing. This risk is mitigated by China's climate change commitments in its INDC, the 2015 Paris Agreement, and the 13th Chinese 5-year plan 2016-2020. However, even if phase III of NZEC would not materialise, the previous phases would still have significantly contributed to the strengthening of EU China relations on a key climate change topic, and to the generation of knowledge about the feasibility of CCS development in China and beyond.

## **7. Complementarity**

In its INDC to COP21 Paris, China included among its climate change priorities to 'strengthen research and development and commercialization demonstration for low-carbon technologies, such as ... carbon capture, utilization and storage and to promote the technologies of utilizing carbon dioxide to enhance oil recovery'<sup>9</sup>. CCS shall thereby contribute to China's main international climate commitment, to peak carbon dioxide emissions around 2030 and make best efforts to peak early.<sup>10</sup>

Further roll-out of CCS in China is expected in the longer-term until 2050, as described in the November 2015 'Roadmap for Carbon Capture and Storage Demonstration and Deployment in the People's Republic of China'.<sup>11</sup> By 2014, nine CCS pilot projects were implemented in China, mainly in the power and coal-chemical sectors.<sup>12</sup> CCS is a proven but complex technology. China has consistently expressed interest to deepen its CCS cooperation with the EU, on the official, technical, and commercial level. The proposed EU-China CCS project offers the ideal platform to deepen this cooperation in the mutual interest. Complimentary action by other donors (UK, Norway) will be partially integrated in and well-coordinated with this project.

It is expected that significant business opportunities for EU-based companies will flow from the continuation and intensification of CCS cooperation between the EU and China.

## **8. Other**

N/A

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<sup>9</sup> <http://www4.unfccc.int/submissions/INDC/Published%20Documents/China/1/China's%20INDC%20-%20on%2030%20June%202015.pdf>

<sup>10</sup> Ibid, p.5

<sup>11</sup> <http://www.adb.org/sites/default/files/publication/175347/roadmap-ccs-prc.pdf>

<sup>12</sup> Ibid, p5